

FIRE ANT MYRMECOPHILES: NEW HOSTS  
AND DISTRIBUTION OF *MYRMECAPHODIUS*  
*EXCAVATICOLLIS* (BLANCHARD) AND *EUPARIA*  
*CASTANEA* SERVILLE (COLEOPTERA: SCARABAEIDAE)

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ABSTRACT

New ant hosts and distribution records from Alabama, Florida, Georgia, Louisiana, Mississippi, and Texas are reported for *Myrmecaphodius excavaticollis* (Blanchard) collected from nests of *Solenopsis invicta* Buren (red imported fire ant), *S. richteri* Forel (black imported fire ant), *S. geminata* F. (tropical fire ant), *S. xyloni* McCook (southern fire ant), and *Iridomyrmex humilis* (Mayr) (argentine ant). New ant host and distribution records from Florida and Georgia are reported for *Euparia castanea* Serville collected from nests of *S. geminata* and *S. xyloni*. The occurrence of both species of beetle from the same nests of *S. geminata* and *S. xyloni* is reported for the first time. The range of *M. excavaticollis* is expanding while the range of *E. castanea* is decreasing. Both species of beetle occur in abandoned mounds of the host ants.

The myrmecophiles, *Myrmecaphodius excavaticollis* (Blanchard) and *Euparia castanea* Serville, were thought to be host specific to *Solenopsis invicta* Buren and *S. geminata* F., respectively, by Woodruff (1973) who reported the distribution of both species of beetle in Florida. Collins and Markin (1971) reported the distribution of *M. excavaticollis* only by state and used the now obsolete name *S. saevissima richteri* Forel for the host (shown by Buren, 1972, to be 2 species *S. invicta* and *S. richteri* Forel, in the United States).

In this paper we report new hosts and new distribution records for the 2 myrmecophilous scarabs.

MATERIALS AND METHODS

Entire or partial colonies of ants were collected in the field and brought into the laboratory for study. These colonies were separated from the soil, and all myrmecophilous scarabs found are reported herein.

All colonies were collected in 5-gal buckets except those collected outside Alachua Co., Florida, in 1975. The remaining collections were made in 1-gal buckets. The inside rims of the buckets were dusted with talc to prevent the ants from escaping. Lids were placed on the buckets during transit to comply with quarantine regulations.

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In the laboratory the ants and any myrmecophiles were separated from the soil by dripping tap water into the buckets at a rate of ca. 1 drop/sec from medical intravenous fluid tubes. The ants moved their brood to the soil surface as the water slowly saturated the soil in the buckets until the ants, brood, and myrmecophiles floated on the water surface. They were then transferred to a dry container rimmed with talc. The myrmecophiles were found with the ants or swimming free in the water. However, all of the beetles collected from FLORIDA: *Hillsborough Co.*, Plant City, Arizona Land and Cattle Co., were floated in the field by placing a steel drum, with the ends removed, around a mound and trickling in water until the mound was inundated. Also, all of the beetles collected from pastures or lawns in Georgia were hand picked from the ant mounds; flotation was not used on these mounds.

The following abbreviations are used in the list of collections: CTA, C. T. Adams; JDA, J. D. Atwood; WAB, W. A. Banks; DMH, D. M. Hicks; DPJ, D. P. Jouvenaz; JKP, J. K. Plumley; KHS, K. H. Schroeder; JWS, J. W. Summerlin; and DPW, D. P. Wojcik. All specimens are in the collection of DPW or were used in biological observations or experiments (Wojcik 1975). Multiple numbers in parentheses in the collection list indicate the number of beetles obtained from separate ant nests collected on the same date at that location, i.e., (3,2,4). Unless otherwise indicated, all ant nests were collected on road shoulders or opposing banks.

## RESULTS

In the Southern United States, 1920 specimens of *M. excavaticollis* were collected in association with 4 species of *Solenopsis* and 1 species of *Iridomyrmex*, and 655 specimens of *E. castanea* were collected in association with 2 species of *Solenopsis*.

*Myrmecaphodius excavaticollis* is common in mounds of the widespread *S. invicta*. The most recent distribution of *S. invicta* is given by Lofgren *et al.* (1975) and USDA (1976). Collins and Markin (1971) reported this beetle from AL, FL, GA, LA, MS, NC, and TX. Records given here are from 234 nests in AL, FL, GA, LA, MS, and TX.—ALABAMA: *Autauga Co.*, Jct. US-31 & I-65, 23-X-75, DPW & DMH (1); *Chilton Co.*, Clanton, 30-VI-73, DPW & WAB (2,1); *Conecuh Co.*, Evergreen, 8-XII-75, DPW (4,1); *Covington Co.*, Andalusia, 8-XII-75, DPW (4,1,2); *Dale Co.*, Ozark, 24-X-75, DPW & DMH (2,1); *Houston Co.*, Ashford, 24-X-75, DPW & DMH (2); *Jefferson Co.*, Graysville, 23-X-75, DPW & DMH (3); *Lee Co.*, Chewacla St. Pk., 30-VI-73, DPW & WAB (1), Opelika, 1-VII-73, DPW & WAB (3); *Mobile Co.*, Bucks, 18-VI-75, DPW (1 collected as larvae; 1); *Montgomery Co.*, Mt. Meigs, 30-VI-73, WAB & DPW (1); *Russell Co.*, Phenix City, 1-VII-73, WAB & DPW (1); *Shelby Co.*, Pelham, 30-VI-73, DPW & WAB (1), Shelby Co. airport, 23-X-75, DPW & DMH (14,6); *Tuscaloosa Co.*, Northport, 21-X-75, DPW & DMH (1). FLORIDA: *Baker Co.*, on SR-121 10 mi S of Macclenny, 17-VII-73, DMH (1,4,1) Glen St. Mary, 7-VIII-73, DMH (1), 5-XII-73, DMH (1,4,1,1,1), 7-XII-73, DMH (4), Macclenny, 13-VIII-73, DMH (4,2,1,2,9); *Bradford Co.*, Brooker, 5-I-73, DPW (1), Lawtey, 23-VIII-72, DPW (1), 4-III-74, DMH (2), 24-IV-74, DPW (1,2,6; 1 teneral), 18-IX-74, DPW & DMH (1,4,1,1,1), Starke, all DPW, 9-I-73 (1,6,1,3), 1-IV-73 (1,3), 8-VI-73 (1), US-301 2 mi N of Starke, all DPW, 5-II-71 (17), 12-II-71 (3), 19-II-71 (2), US-301 3.2 mi N of Starke, 26-II-71, DPW (3 from abandoned mound; 2); *Calhoun Co.*, SR-20 at Chipola River, 9-XII-75, DPW (1); *Clay Co.*, Highlands, all DPW, 23-VI-70 (5,3,38,27,11), 16-VII-70 (9,7,4), 24-VIII-70 (1), 7-XII-70 (1,1), 14-XII-70 (27,1), 29-I-71 (3,5), Middleburg, 20-IX-75, DMH (3), 6-I-76, JKP & DMH (3); *Duval Co.*, Baldwin, 19-III-73, DPW (1), 12-VI-73, DPW (1), Cecil Field Naval Air Sta., 8-VII-70, DPW (3), Dee Dot Ranch, 2 mi W of Jacksonville Beach, 17-V-73, DPW (1), 20-VII-73, DPW (1), Maxville, 20-V-70, DPJ (2), 5-VI-73, DPW (3,1), 1-III-74, DMH (1,3,11,4,5), 8-III-74, DMH (5), 30-V-75, DPW (2), Whitehouse, 2-VIII-73, DPW & DMH (1,1,2,1,2,1); *Escambia Co.*, Pensacola Beach,

19-VI-75, DPW & DMH (1), Warrington, 22-VI-75, DPJ (1); *Hernando Co.*, Masaryk-town, 17-XI-75, DPW and DMH (1); *Hillsborough Co.*, Lutz, 31-VII-75, WAB & JKP (1), Plant City, Arizona Land and Cattle Co., all JWS & KHS, all pasture, 4-II-71 (2), 5-II-71 (6), 20-IV-72 (3), V-72 (1,3,1,3,2,1,3,1,2,3); *Jefferson Co.*, Capps, 8-XI-74, DMH & JKP (2,8), Monticello, 9-II-72, DPW (13), Jct. US-19 & I-10, 5 mi S of Monticello, 26-VII-73, DMH & JKP (4), 16 mi N of Monticello, at wayside park at Georgia border, 19-XI-75, DPW & DMH (2); *Leon Co.*, Lafayette, Southwood Plantation, 12-IX-74, DPW, pasture (1,1,1,1); 9-X-74, DPW, pasture (4 from abandoned mound; 1,6,1,4), 5-VIII-76, WAB, pasture (23), 31-VIII-76, WAB, pasture (4), Tallahassee, 26-VII-73, DMH & JKP (1,1,1), Tallahassee, Tall Timbers Res. Station, 1-III-73, DPW, lawn (7 from abandoned mound; 6); *Marion Co.*, Reddick, 1-II-74, DMH & JKP (2); *Orange Co.*, Orlando, 6-V-71, JWS & KHS (1); *Polk Co.*, Winter Haven, 15-X-75, WAB & JKP (2); *Sarasota Co.*, Myakka River State Park, DPW & DMH, grassy field (1); *Seminole Co.*, Roadside park at Jct. of SR-46 & St. Johns River, 11-IX-75, DPW & DMH, grassy field (1); *Sumter Co.*, Jct. of I-75 & SR-478, 16-I-76, DPW & JKP (1), Wildwood, 8-I-74, DMH & JKP (1); *Union Co.*, Lake Butler, 28-XI-73, DMH (1,1); *Wakulla Co.*, Newport, 9-XII-75, DPW (2). GEORGIA: *Colquitt Co.*, Hartsfield, 11-VII-72, DPW, pasture (3,1,3,1,4,1,2), 12-VII-72, DPW, pasture (1 collected as larvae, 2 collected as pupae), 19-VIII-72, DPW, pasture (1 collected as larvae; 1,7,2); *Loundes Co.*, Valdosta, 6-V-71, DPW & JKP (3); *Mitchell Co.*, Sale City, 11-VII-72, DPW, pasture (1), 12-VII-72, DPW, pasture (1,1,1), 28-VIII-72, DPW, pasture (1); *Muscogee Co.*, Columbus, 1-VII-73, DPW & WAB (4); *Sumter Co.*, Plains, 11-IX-75, JKP & CTA (1); *Thomas Co.*, Coolidge, 12-VII-72, DPW, pasture (1 teneral, 1 collected as larvae, 2 collected as pupae; 1,1), 12-VII-72, WAB, pasture (1 collected as larvae); *Tift Co.*, Tifton, 18-XII-70, DPW (3 collected from abandoned mound; 17,21,8,36,17), 6-V-71, DPW, pasture (3 collected as larvae); *Turner Co.*, Ashburn, 22-IV-71, DPW, lawn (1 collected as larvae), 26-IV-72, DPW & JWS, pasture (15,1,2,3,1,8), Coverdale, 22-VI-71, DPW, pasture (1 collected as larvae; 1), 26-IV-72, DPW & JWS, pasture (10), Sycamore, 22-VI-71, DPW, pasture (1), 26-IV-72, DPW & JWS, pasture (2,1,2,2); *Worth Co.*, Sylvester, 21-VII-72, DPW, pasture (1 collected as larvae; 1) 31-VIII-72, DPW, pasture (1). LOUISIANA: *Ascension Par.*, Gonzales, 5-XII-75, DPW (2); *Assumption Par.*, Belle Rose, 5-XII-75, DPW (1); *Concordia Par.*, 29-VI-73, DPW & WAB (3,7); *Evangeline Par.*, Chicot State Park, 29-VI-73, DPW & WAB (9); *Rapides Par.*, Alexandria, 29-VI-73, WAB & DPW (6); *St. Charles Par.*, Paradis, 4-XII-75, DPW (2); *St. James Par.*, Union, 5-XII-75, DPW (2); *Tangipahoa Par.*, Hammond, 4-XII-75, DPW (1), 6-XII-75, DPW (3); *Vernon Par.*, Leesville, 28-VI-73, DPW & WAB (6,1). MISSISSIPPI: *Claiborne Co.*, Port Gibson, 29-VI-73, WAB & DPW (2); *George Co.*, Lucedale, 7-XII-75, DPW (2); *Harrison Co.*, Lyman, 6-XII-75, DPW (1); *Jackson Co.*, Escatawpa, 7-XII-75, DPW (1); *Lauderdale Co.*, Lauderdale, 21-X-75, DPW & DMH (1), Marion, 21-X-75, DPW & DMH (1); *Pearl River Co.*, Poplarville, 6-XII-75, DPW (1). TEXAS: *Brazos Co.*, College Station, all JWS, 27-I-75 (6); 26-II-75 (12,18), 10-VI-75 (3,3), 19-VI-75 (16), 29-VIII-75 (4), 31-XII-75 (2), 9-I-76 (6), 18-I-76 (3), Millican, 9-VI-75, JWS (1); *Grimes Co.*, Anderson, 28-II-75, JWS (1); *Polk Co.*, Alabama and Coushatta Indian Reservation, 28-VI-73, DPW & WAB (1); *Walker Co.*, Huntsville, 28-VI-73, DPW & WAB (6).

*Myrmecaphodius excavaticollis* was collected from 38 nests of *S. richteri*, the black imported fire ant, in AL and MS.—ALABAMA: *Lamar Co.*, Sulligent, 30-VI-73, WAB & DPW (1), 10 mi N of Sulligent on SR-17, 4-X-73, DMH & JKP (3,20,2,17,21), Vernon, 30-VI-73, WAB & DPW (15,22), 23-X-75, DPW & DMH (5,1); *Marion Co.*, SR-129 to Glen Alan, 30-VI-73, DPW & WAB (4), Winfield, 23-X-75, DPW & DMH (14,7); *Pickens Co.*, Cochrane, 1-IV-76, DPW & JKP (4), Aliceville, 1-IV-76, DPW & JKP (19); *Walker Co.*, Carbon Hill, 23-X-75, DPW & DMH (2). MISSISSIPPI: *Chicasaw Co.*, 1/2 mi S of mile post 224 on Natchez Trace Hwy., 22-X-75, DPW & DMH (1), Houston, 22-X-75, DPW & DMH (2); *Choctaw Co.*, Fentress, 29-VI-73, DPW & WAB (1,6); *Lee Co.*, 1 mi N of Nettleton on US-45, 22-X-75, DPW & DMH (2,3); *Noxubee Co.*, Brooksville, 23-X-75, DPW & DMH, pasture (1,8,2,14,4,1,6), 1-IV-76, DPW & JKP (21,41,9,15,4,3,4); *Oktibbeha Co.*, Mississippi State, 29-VI-73, WAB & DPW (1,11).

*Myrmecaphodius excavaticollis* was collected from 88 nests of *S. geminata*, the tropical fire ant, in FL and TX.—FLORIDA: *Alachua Co.*, Gainesville, 20-IX-74, DMH & JKP (1,4), Paynes Prairie, along US-441, all DPW & DMH, 12-IX-70 (1), 5-II-71 (19,24,14,42,22), 12-VI-73 (5), 24-IX-74 (31,1,7,1,2,20,1), 1-X-74 (10 in abandoned mound; 18,3,4,2,8,7,4,2,6), 16-X-74 (2 & 1 in abandoned mounds; 24,4,58), 30-X-74 (1 & 1 in abandoned mounds; 7,1,14,1,2,3,1,3,1,5,1), 22-XI-74 (2,1,3,1,2,1,3,1,3,2,3,5,1), 3-XII-74 (2,4,8,1,3,5,3,1), 22-IV-75 (2), 6-VI-75 (2,3,2,1,2,4,1,4), 23-III-76, DMH & JDA (6,5,6),

24-III-76, DPJ, DMH & JDA (9,41,19,55), 3-IV-76, DPJ & JDA (3,1). TEXAS: *Brazos Co.*, Bryan, 3-IV-75, JWS (1), 15-III-76 (1), College Station, 23-II-75, JWS (11), Texas A & M Farm, 17-III-75, JWS (26, 7). See additional records in discussion of *M. excavaticollis* and *E. castanea* collected from the same nest.

*Myrmecaphodius excavaticollis* was collected from 4 nests of *S. xyloni* McCook, the southern fire ant, in GA and TX.—GEORGIA: *Morgan Co.*, 4 mi S of Madison at Jct. of I-20 & US-441, 9-X-75, DPW & DMH (3); *Oconee Co.*, on SR-15, 2 mi N of Co. line, 29-VI-76, DPW (4). TEXAS: *Brazos Co.*, 30-VII-73, JWS (1), College Station, 27-I-74, JWS (1). See additional records in discussion of *M. excavaticollis* and *E. castanea* collected from the same mound.

*Myrmecaphodius excavaticollis* was collected from 2 nests of *Iridomyrmex humilis* (Mayr), the Argentine ant, in AL and LA.—ALABAMA: *Pickens Co.*, Gordo, 21-X-75, DPW & DMH (1). LOUISIANA: *St. Charles Par.*, Paradis, 4-XII-75, DPW (1).

*Euparia castanea* was collected from 50 nests of *S. geminata* in FL and GA; all older records of this beetle species must be critically evaluated because of displacement of its native ant hosts by the imported fire ants (discussed later in this paper).—FLORIDA: *Alachua Co.*, Archer, 15-IV-74, DPW & DMH (1,15,1), Gainesville, 3-I-72, DPW (1), Micanopy, 1-XI-73, DPW & DMH (11,11), 29-IV-75, DPW & DMH (8); *Bradford Co.*, Starke, 1-VI-73, DPW (1), 3.2 mi N of Starke on US-301, 12-II-71, DPW (16), 26-II-71, DPW (1); *Clay Co.*, Penny Farms, 4-V-72, DPW (2); *Levy Co.*, Bronson, 3-X-75, DPW & DMH (2); *Marion Co.*, Belleview, 8-I-74, DMH & JKP (8,25,40), 1-II-74, DPW & DMH (3,1,51), 6-III-74, DPW & DMH (6,18,14,6,4), 26-III-74, DPW & DMH (1,15), 9-IV-75, DPW & DMH (1,87,8,2,24,7,2,11,10,1,2,5,1,5,9,8,2,11); *Osceola Co.*, Yee Haw Jct., 6-V-73, WAB (1). GEORGIA: *Jenkins Co.*, Magnolia Springs State Pk., 8-X-75, DPW & DMH (2); *McDuffie Co.*, Jct. I-20 & SR-150, 9-X-75, DPW & DMH (3); *Screven Co.*, Sylvania, 8-X-75, DPW & DMH (2,1,16). See additional records in discussion of *M. excavaticollis* and *E. castanea* collected from the same nest.

*Euparia castanea* was collected from 14 nests of *S. xyloni*, in GA.—GEORGIA: *Green Co.*, Oconee Natl. Forest, Macedonia Baptist Church, 2-X-73, JKP & DMH (1,2,1), Jct. I-20 & SR-44, DPW & DMH (4,1); *Oconee Co.*, on SR-15, 2 mi N of Co. line, 29-VI-76, DPW (3,25,6); *McDuffie Co.*, Jct. I-20 & US-70, 30-VI-76, DPW (8); *Warren Co.*, Jct. I-20 & SR-223, 9-X-75, DPW & DMH (5,2), Jct. I-20 & Cedar Rocks Rd., 30-VI-76, DPW (2,8,1). See additional records in discussion of *M. excavaticollis* and *E. castanea* collected from the same nest.

Both *M. excavaticollis* and *E. castanea* were collected from the same nests of *S. geminata* 10 times (M=*M. excavaticollis*, E=*E. castanea*), in FL.—FLORIDA: *Alachua Co.*, Gainesville, 15-IV-74, DMH & JKP (18 M, 1 E), 4-III-76, DPJ & DMH (27 M, 1 E), Paynes Prairie, along US-441, all DPW & DMH, 20-IX-74 (14 M, 1 E), 1-X-74 (2 M, 1 E) (1 M, 1 E), (17 M, 1 E), 16-X-74 (1 M, 1 E) (abandoned mound, 1 M, 1 E), 22-XI-74 (1 M, 3 E) 3-XII-74 (15 M, 1 E).

Both species of beetle were also collected twice from the same nest of *S. xyloni*, in GA.—GEORGIA: *Green Co.*, Jct. I-20 & SR-44, 9-X-75, DPW & DMH (1 M, 66 E); *Oconee Co.*, on SR-15, 2 mi N of Co. line, 29-VI-76, DPW (5M, 4E).

## DISCUSSION

*Myrmecaphodius excavaticollis* was apparently introduced from South America with one or both of the 2 species of imported fire ants (Lofgren *et al.* 1975). It is now expanding its range faster than either of its imported hosts and is now found with 5 hosts. It is not known how many species of ants this beetle has as hosts in South America. Several hundred nests of 24 other genera of ants have been examined for myrmecophiles. *Myrmecaphodius excavaticollis* or *E. castanea* were never found in these nests, although other myrmecophiles were collected. No other ants in the Southern United States build large earthen mounds like the *Solenopsis* species. However, *I. humilis*, like the *Solenopsis* species, has very large, populous colonies with large amounts of accessible brood in the soil or under debris. Since both *M. excavaticollis* and *E. castanea* eat ant brood (Wojcik 1975), such large amounts of brood in soil chambers give these beetles easy access to their main food source.

Both species of beetle were collected from abandoned host mounds. These collections often included teneral adults, larvae, and pupae, as well as adults.

*Myrmecaphodius excavaticollis* already is occasionally very abundant in black light trap collections (Wojcik 1975, Woodruff 1973). This beetle can be expected to become very common in light trap collections in the Southern United States as it increases its range. Thus though detection of *M. excavaticollis* by black light traps was once suggested as a method of survey for imported fire ants (Anonymous 1967), the idea is no longer feasible since *M. excavaticollis* has been collected with both species of native fire ants and from abandoned ant mounds in the Southern United States.

*Euparia castanea* was never collected from nests of *S. invicta* (1500+ nests floated from 7 states) nor from the nests of *S. richteri* (106 nests floated from 2 states). *M. excavaticollis* can be expected to become more abundant and widespread; and *E. castanea* can be expected to become much less common as *S. invicta* (the more important and widespread imported host) expands its range and eliminates or decreases the populations of *S. geminata* and *S. xyloni* (Whitcomb *et al.* 1972, Roe 1973, Naves 1974).

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